Story by Kathy Wythe

Research needs to address ASR challenges

For all its benefits, aquifer storage and recovery (ASR) does have some potential challenges that warrant further research and planning, according to scientists and others involved in ASR.

In 2005, the National Research Council (NRC) convened a Committee on Sustainable Underground Storage of Recoverable Water to evaluate past experiences with ASR, or what the committee called *managed underground storage* (MUS) of recoverable water. Another committee goal was to identify the research priorities for development of future underground storage projects.

The NRC committee said MUS "poses its own unique challenges that need to be addressed through research and regulatory measures."

The committee's report, "Prospects for Managed Underground Storage of Recoverable Water," assesses the factors affecting the performance of managed underground storage system projects. The committee made numerous recommendations for needed research and regulatory needs. These recommendations along with the full report may be read at http://www.nap.edu/catalog.php?record_id=12057.

One overall recommendation of the NRC committee is the creation by water agencies of "an independent advisory panel … to provide objective, third-party guidance regarding design, operation, maintenance, and monitoring strategies for these projects."

The committee also said that water managers considering underground storage should "incorporate 3-D capable geographic information systems to map and analyze major aquifers as part of comprehensive, regional planning efforts."

Dr. Robert Mace, Texas Water Development Board's (TWDB) director of the groundwater resources division, said Texas has the information to do the 3-D imaging through the TWDB's groundwater availability modeling (GAM) program, and TWDB is asking the legislature for support in developing this system.

To better predict the success and effects of a managed underground storage system, the NRC report recommends further research on

various aspects of the hydrologic feasibility of these projects, their impacts on surface water, and the hydrogeologic properties of underground aquifers.

Dr. Zhuping Sheng, associate professor at the Texas AgriLife Research and Extension Center at El Paso, who served on the committee, agreed that understanding the hydrogeologic properties of aquifers is critical.

"More research is needed to analyze different aquifer properties to identify what kind of aquifer is more appropriate for storage," he said.

The committee also recommends more research on understanding potential contaminants in the source water and the interaction of the source water with the native water in the storage aquifer.

"The ASR system poses significant challenges around issues related to water quality requirements for injected water and recovered water," Sheng said. Issues dealing with mixing the source water with the native groundwater or freshwater with saline water, potential removal processes for various contaminants and microbes, and having the correct water quality indicators for source water and recovered water, need to be better understood through additional research, he said.

Mace said understanding the water quality issue is necessary when considering implementing an ASR project. "When you mix two different types of water, you can get strange chemical things to happen, such as materials coming out of solution or precipitating, which can then block pores of the aquifer and decrease the ability for the water to get into the aquifer or come out."

The economic and regulatory aspects of underground storage are other areas that need additional examination and solutions from the federal, state, and local water regulatory authorities. Science-based criteria for residence time, travel time, or travel distance regulations for recharge water recovery should be developed, Sheng said.

The NRC report recommends that a model state code be drafted to assist states in developing regulatory programs for these systems. Sheng suggested that an economic analysis of a MUS project should address how the multiple benefits and costs of the project should be captured.

Dr. Allan Jones, Texas Water Resources Institute's (TWRI) director, agreed that more research is needed in the ASR field.

"Based on the information in the committee's report, there is clearly a need for more research on ASR or MUS systems," he said. "Scientists from The Texas A&M University System and other Texas universities have the expertise to make valuable contributions to this growing area of water management. We at TWRI look forward to helping facilitate research projects coming out of the committee's recommendations."